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ADVANCED SIMULATIONS FOR THE ASSESSMENT OF ENVIRONMENTAL AND MAN-MADE EFFECTS ON STRUCTURES

A. LARESE*, R. ROSSI† AND R. WÜCHNER+

* Università degli Studi di Padova, via Trieste 63, 35121 Padova, Italy
antonia.larese@unipd.it

† International Center for Numerical Methods in Engineering CIMNE
Universitat Politécnica de Catalunya, C. Gran Capitá s/n, 08034 Barcelona, Spain

+ Technical University of Munich, Arcisstr. 21, D-80333 München, Germany

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ABSTRACT

The use of novel computational methods, able to exploit HPC hardware, in combination with advanced modeling approaches is opening new possibilities in the predictive simulation and assessment of the effects caused by environmental phenomena up to city and landscape scale. Examples of application range from the appraisal of built infrastructure on the surroundings, e.g. the impact of buildings on citys wind maps, up to the assessment of natural or man-made events on populated areas, like the evaluation of heavy storms, flooding, erosion, rockfall, avalanches and mud-flow effects in relation to the design of structures. A common requirement of such techniques is the need for refined modeling of the relevant surroundings and specific potentially coupled physics, robust and efficient numerical methods to cope even with complex geometries defined over huge domains, up to the challenging task of validation to ensure the predictive quality of the simulations. This includes the use of realistic topographic data and the capability to obtain realistic 3D simulation scenarios from (e.g. publicly available) infrastructure data which requires even the integration of different sources for simulation input, like the combination of terrain and building models together with pollutant sources. Furthermore, the respective computational techniques need to adequately account for the complex physics in the respective application scenario, e.g. the simulation of the turbulent flows and flow-structure interaction effects in wind engineering, the non-linear behavior of mud-flow, the impact effects of rocks and debris into protective structures, or aspects of the design of safe structures. Systematic Verification and Validation activities conclude the adoption of modern computational techniques in the field of simulation-based assessment of environmental and man-made effects on infrastructure. Therefore, this minisymposium addresses innovative contributions in the fields of extended modeling, refined and novel (potentially coupled) simulation methods, as well as contributions to the validation of the latter, e.g. by systematic experiments or field tests. The goal of the proposed minisymposium is to gather experts in the field in order to identify common needs and solutions, as well as to foster new collaborations in the field.